



Monitoring Subalpine Butterflies as Climate Changes

Introduction

Climate change is expected to affect mountain ecosystems in many ways. Climate models project warmer summers, earlier snowmelt, more frequent forest fires, and changes in distributions of plants and animals. Although some ecosystem changes have already been observed (e.g., shrinking glaciers), many future impacts remain uncertain. Monitoring provides a means to document ecosystem changes, anticipate future changes, and improve management of protected lands.

Butterflies are sensitive indicators of climate change because air temperature influences their life cycle and their geographic distribution. As individuals develop from egg to larvae to pupae and finally to mature butterfly, temperature thresholds may trigger these changes. Annual temperature patterns are often primary determinants of the distribution of “generalist” butterflies. Generalists are species that can utilize many different plant species for nectar, larval development, and egg deposition. Specialist butterflies depend on a few plant species for food and development and they can be directly and indirectly influenced by climate (e.g., temperature and precipitation).

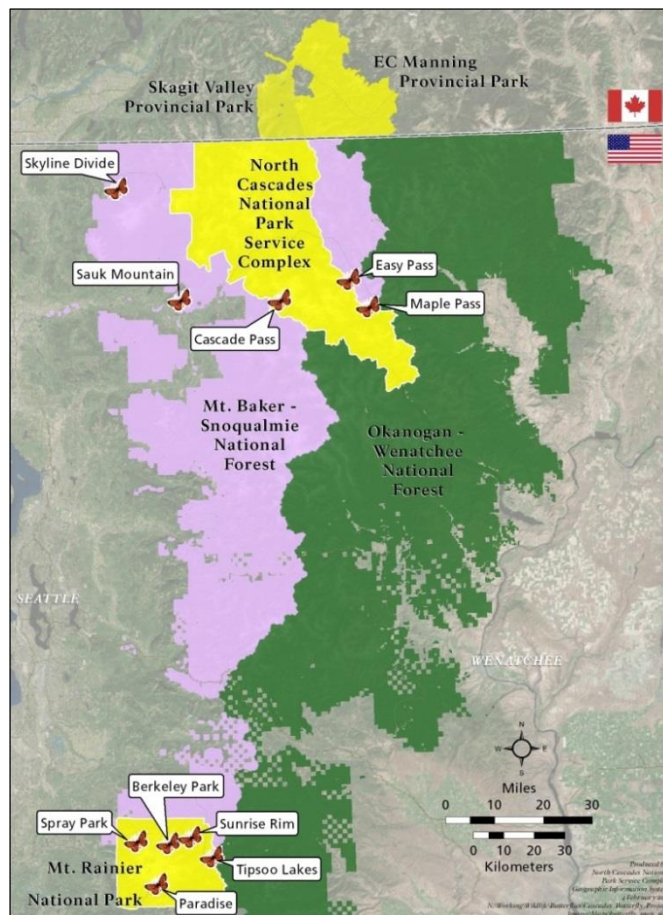
Recently, studies in Europe and California have documented range shifts in butterflies in response to changing temperatures. As average annual temperatures have increased, some species have responded by moving northward or to higher elevations to track their optimal temperature range.

However, scientists still have many questions about the long-term survival of many butterfly species. Plants are also sensitive to climate change and if the timing of host plant development (phenology) changes at a different rate than butterflies, this will also impact butterfly survival.

What Are We Doing?

We are using two approaches: 1) photo-inventories of butterflies and 2) monitoring butterfly abundance and plant phenology at ten permanent survey sites in two national parks and two national forests:

- North Cascades National Park Service Complex
- Mount Rainier National Park
- Mount Baker-Snoqualmie National Forest
- Okanogan-Wenatchee National Forest



Monitoring Objectives

1. Engage citizen scientists in collection of data and communication of information to the general public
2. Monitor long-term trends in butterfly species richness and population abundance in select areas
3. Monitor long-term trends in plant phenology
4. Provide data to national parks and forests to inform and adapt land management as climate changes



Interested in Helping?

We are looking for help with photo-inventories and monitoring along permanent survey routes.

Photo-Inventories

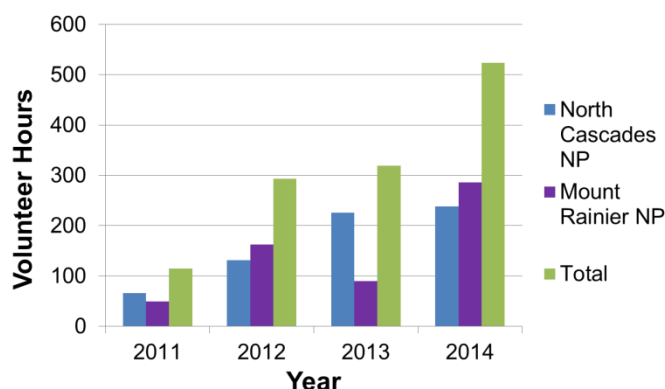
Just grab your camera, take butterfly photos while you are hiking, and upload them to our project site at Butterflies and Moths of North America (butterfliesandmoths.org). You will need to get a log-on and mark the location of your photo on a map. We are working with experts who will identify or verify your identification of the butterfly species.

Monitoring Methods

- Butterfly abundance is monitored along ten 1-kilometer survey routes in 2 national parks and 2 national forests:
- Butterflies are monitored weekly from snow-melt (~early July) until the first frost (~early September)
- Butterfly abundances are monitored using the Pollard Walk method
- Plant phenology is monitored following National Phenology Network (NPN) guidelines
- Butterfly data are stored in partnership with the North American Butterfly Monitoring Network's PollardBase database (NABA) and Butterflies and Moths of North America (mp.butterfliesandmoths.org)

Results – Volunteer Involvement

Our program started in 2011 and our volunteer corps is growing allowing us to survey sites more frequently.



Results - Butterflies

Table 1. Summary of number of surveys, species documented, and butterflies from 2011 to 2014

Year	# Surveys	# Species	# Butterflies
2011	29	23	780
2012	29	21	479
2013	34	21	1,665
2014	66	30	2,556



Milbert's Tortoiseshell



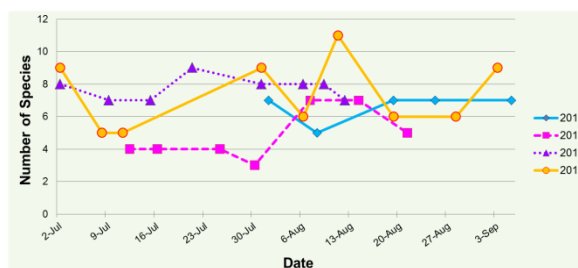
Anna's Blue



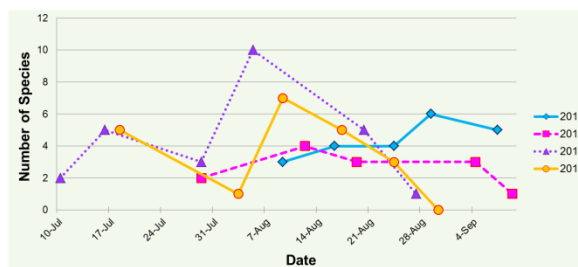
Anise Swallowtail



Mariposa Copper



Species Richness at Sauk Mountain 2011- 2014



Species Richness at Maple Pass 2011- 2014

More Information

Regina M. Rochefort, Ph.D.
 North Cascades National Park Service Complex
 Email: regina_rochefort@nps.gov
 Phone: 360-854-7202

